INDEPTH STUDY OF UPPER PRIMARY SCIENCE TEXTBOOKS

REPORT

PART I

Class - VI

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FOREWORD

The National Policy on Education (1986) emphasises that the science education upto the secondary level may be imparted as one area of human endeavour rather than as compartmentalized sub-disciplines. The National Curriculum for Elementary and Secondary Education - A Framework, developed by NCERT in 1985 and revised in 1987, provides a concrete structure to develop a relevant science curriculum reflecting the goals of NPE-1986.

The present set of science textbooks for the upper primary level were developed to achieve the objectives laid down by NPE-1986.' Main emphasis is on concept learning rather than on mere information. The contents and activities included in these books have been organised to inculcate knowledge, skills and scientific temper. Care has been taken that learning takes place through observation and interaction with the natural environment of the learners.

Starting with textbook for class VI in 1987, the whole task of developing textbooks for upper primary stage was completed by 1989. The present study is taken up to receive feedback which would help us to achieve the aims of science education by improving upon our curriculum packages. The questionnaire method was adopted for collecting the data from the students and teachers due to administrative difficulties, knowing very well the limitations of the method. However, wherever possible interview with students and teachers were conducted to check the authenticity of the data.

The first phase of the study that is evaluation of the textbook **Science** for class VI was completed in 1991, with the main objective to assess its utility from the point of view of child centred learning.

The study shows that this book is well accepted by the students despite their desire for coloured pictures and diagrams, lesser number of descriptive questions, good binding etc. Though the

language of the book is within the comprehension level of the students, the teachers are of the view that a still simpler language will increase the readability of the book. The contents and activities included in this book is well assimilated by the students.

I am grateful to all the students and teachers who responded to the questionnaire and to all those who had attended the review workshops held at National Institute of Education, Delhi from August 5 to 8, 1991 and at Regional College of Education, Bhopal from March 23 to 27, 1992.

In this regard I particularly express my thanks to Professor C. Singh and Dr. P.S. Jaiswal who provided expert advice on the study.

Professor B. Ganguly (now retired), Dr. K.B. Gupta, Shri R. Joshi, Dr. B. Prakash extended their valuable suggestions during the study. Professor D. Lahiry actively involved himself in this study and provided valuable guidance. I am thankful to all of them.

Dr.(Mrs.) Jaishree Sharma who put on hard work and co-ordinated the study deserves all appreciation.

Suggestions and comments on this study are welcome.

July 24, 1992

(K.V. Rao)
Professor and Head

Workshop on Indepth Study of Upper Primary Science Textbooks held at:

(i) NIE Campus, New Delhi-110016 from August 5 to 8 1991

(ii) RCE, Bhopal, from March 23 to 27 1992.

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INTRODUCTION

Education is a dynamic process and hence it continues to evolve, extend and diversify. By its very nature, it influences and also gets influenced by the development process. There is hardly any field of activity or sector of development which is not influenced by education in some or the other way. Similarly, there is no sector of development which does not have its impact on the system of education. It is therefore, essential to continuously renew the content and process of education to tune it with the changing needs, aspirations and demands of the society.

In the post independence period, therefore, a series of efforts were made to restructure the education system in India. The reports of various education commissions form the basis for the same. However, we shall continue our deliberation to only those which relate to school education, with a particular reference to science education.

Education Commission (1952-53)

The Secondary Education Commission recommended an 11 year pattern of school education. The important two features of the recommendation were:

- The creation of multipurpose schools, and
- Diversification of courses from class IX onwards.

It is however to be noted that the study of science in one form or the other was felt necessary. Though some of the states, Union teritories accepted this pattern, there still

remained a number of states and union territories which continued with the earlier high-school pattern of education followed by a two year intermediate course at the college or university level. Though the science was compulsory for all upto class VIII, in many of the schools all over the country the girls were given a softer option of home-science in lieu of science.

Even the most brief Science Policy Resolution (1958) of the Government of India, stressed for the strengthening of Science Education at all the stages.

Emergence of 10-year of General Education System:

The note worthy feature of Education Commission (1964-66) was that it took a comprehensive view of the entire educational system in relation to the national development. Amongst the other things, the commission recommended a 10+2+3 system of education which was accepted by the parliament through its resolution as National Policy on Education in 1968. The acceptance of a common educational structure of 10+2+3 pattern all over the country thereafter, helped the emergence of National System of Education, comprising of a 10-year of general education for all till the secondary stage. which was followed by 2-year of diversified education at Senior Secondary Stage and a subsequent 3-year education after the school stage. One of the unique features of this scheme was the study of science in the form of different disciplines (Physics, Chemistry and Biology) from class VI onwards.

Structural Uniformity

In 1975, the National Council of Educational Research and Training (NCERT) attempted to give a concrete shape to the recommendations of the Education Commission (1964-66) and to the resolution on National Policy on Education (1968) by developing "The Curriculum for Ten Year School - A framework". It represented the first attempt to restructure and reorient the content and process in school education. The ten years of general education with a set of common objectives, common scheme of studies and other details as suggested by the document was gradually accepted by all the States and Union-territories. Structural uniformity of the education-system was indeed a significant gain but the implementation of the curriculum framework couldnot progress evenly in all States and Union Territories.

The reasons for the uneven progress were perhaps:

1. Lack of comprehensive plan in
    i) linking the curriculum changes with the process of teaching and learning.
    ii) teacher-training
    iii) examination reform.
2. Wide spread desparities in physical and human resources necessary for effective transaction of curriculum in schools.

National Policy on Education - 1986

The mismatch between the curricular objectives and the actual transactions of the curriculum created not only a wide-spread desparity in the levels of attainment by the students but also in the standard of education in schools, in different parts of the country, which generated a concern for overcoming this problem. Besides, it was also realised that the country has reached such a stage in its economic and technical developments, which demands that major efforts be made to derive maximum benefit from its assets. Also it must be ensured that the outcome of the change, reaches all the sections of the society. Moreover, the school-going children of today will have to face new challenges created by the changing conditions.

Keeping the above facts in view, the government of India announced in January 1985 that a new education policy would be formulated. As a result of comprehensive appraisal of the existing educational-scene, followed by a country-wide debate; National Policy on Education 1986 was formulated. To provide a solid foundations to the National Policy, a National curriculum for Elementary and Secondary Education - A frame-work was developed by the NCERT. Accordingly the Science Education was imparted as one area of human endeavour.

National Curriculum........... - A framework:

The salient features of the framework are:

- i) Provision of equal educational oppertunity to all, not only in terms of access to educational facilities

but also in terms of conditions for success.

A common 10+2+3 structure of education.

A national curricular framework which contains a common core along with other components that are flexible.

The common core includes the history of India's freedom movement, the constitutional obligations and other contents essential to nuture national identity. These elements are to cut across subject areas and are designed to promote values such as India's common cultural heritage, egalitarianism, democracy and secularism, equality of sexes, protection of environment, removal of social barriers, observance of small family norm and inculcation of scientific temper.

Introduction of norms of minimum levels of learning for each stage of education. An educational programme for fostering among pupils an understanding of the diverse cultural and socio-economic system.

Linkage with the world of work and development of enterpreneurship.

Fostering national identity and unity.

Science Education

As far as science education is concerned it emphasised its inclusion as a part of general education. Thus science education has been designed so as to develop in the learner a well-defined abilities and values such as spirit of enquiry creativity, objectivity, the courage to question, problem solving as well as decision making skills and aestnetic sensibility. In addition it should make the relationship of science with health, agriculture, industry and other aspects of daily life evident. Every effort to extend science education to the vast numbers who have remained outside the formal education system has also been stressed.

The objectives of science education as per NPE can be achieved:

1. by improving the general education which would result into improvement in science education.
2. by keeping in mind the problems of first generation learners.
3. by making the language of communicating science message, the language of the student, - a step towards making science education child - centred.
4. by treating science as 'one' area of human endeavour and not as compartmentalised disciplines.
5. by emphasising concept learning instead of stressing the content information.

6. by making the science curriculum need based and relevant to life (both rural & urban).

7. by selecting and presenting topics, commensurate with the learning abilities of the child.

8. by developing 'Science' textbooks up to general education stage as integrated child-centred books.

During the first two years of the Primary stage (classes I and II), science is to be taught as an integrated component of environmental studies. The main thrust here is to sharpen the senses of observation and exploration. Minimum stress is to be given to the imparting of the information. In the classes from III to V i.e. environmental studies (science), the child is to be helped to discover and understand the scientific facts, concepts, principles and processes underlying various phenomena around him.

At the upper primary stage, class VI to VIII, the learner is expected to consolidate and strengthen the abilities acquired at the Primary Stage. In addition understanding of certain simple chemical and biological principles and their operations in nature as well as in daily life is to be emphasised. The student are also expected to acquire skill of manupulating and designing simple science experiments to seek explanation of natural phenomena.

During secondary stage, class IX and X; the content of science is to be organised on the basis of

i) contemporary development in science,

ii) learning abilities of the learner,

iii) enabling the learner to appreciate that science is a continuing human endeavour.

Department of Education in Science and Mathematics in NCERT made an attempt to develop science text-books for all the stages of school education, accordingly.

Statement of the Study

The present study is a part of the evaluation of the science text-books prepared by DESM, NCERT as a follow up of the National Policy on Education (1986). It was felt desirable that the NCERT textbooks need to be evaluated with the help of the users that is, the students and the teachers. In the first phase of the study, efforts have been made to evaluate the class VI, Science textbook entitled 'Science'. The first draft of the book was developed in a workshop comprising of representatives from NCERT, New Delhi; Vikram Sarabhai Community Science Centre, Ahmedabad; Kerala Shastra Sahitaya Parishad, Trivandrum; TIFR, Bombay etc. The draft was then reviewed by teacher educators and subject experts. The modified draft was subsequently reviewed by another group of experts which included practising teachers also.

Preparation of the book

The present class VI science textbook has been developed following feed-back on the previous book, received from the teachers, students and parents. The main objective of the textbook was to make the book child - centred by

i) drawing examples from the immediate environment of the child

ii) using a comparatively comprehensible language. Efforts have been made to:

a) develop the whole exercise as an unit which gives an integrated outlook to the text.

b) make the child aware of the importance of science.

c) help the child develop an over all scientific attitude towards life.

About the book

The textbook consists of thirteen units. The main objective of unit one - Science in Everyday life - was to make the child aware of the (i) importance of science in daily life and (ii) methods of scientific investigation.

The main objective of Unit Two - Things Around Us - is to develop the skill of critical observation.

The main objective of unit three - Separation of Substances - is to help child learn process in science.

The main objective of Unit Four - Measurement - is to make child realise the need of measurement in daily life and also help learn the use of different devices needed for different measurements.

The main objective of Unit Five - Changes Around US - is to help child learn that all changes involve interaction and some form of energy.

The main objective of Unit Seven - The Living World - is to help child critically observe and analise his immediate living environment. Also help to learn to discriminate and appreciate the diversity of life.

The main objective of Unit Eight - Structure and Functions of Living Forms - is to help child appreicate that different organisations are to perform different essentials functions.

The main objective of Unit Nine - Air and Unit Ten - Water- is to make the child appreciate the two most important natural resources and develop the concept of their conservation.

The main objective of Unit Eleven - Energy - is to help the child appreciate the various non-conventional and renewable, sources of energy.

The main objective of Unit 12 - Balance in nature - is to develop the concept that balance in nature is essential for survival.

The main objective of Unit 13 - The Universe - is to help child look beyond its immediate environment.

Though the evaluation has been limited largely to the content it includes aspects of the get up of the book also. But certainly the study does not go into the basics of the curriculum or the syllabus for the class. Also, it neither compares this text-book vis-a-vis other textbooks in science which has been prepared by organisations other than NCERT nor does it compre this text-book with NCERT textbooks of other subjects like mathematics, history, geography, english etc. covering aspects commonly applicable to science as well as social science text-books.

Objectives of the Study

Till now the NCERT has been preparing new textbooks largely on the basis of the vast experience gained by it in the area, and on the basis of the feedback received by it on its textbooks. The feedback has mostly been from the invited practising teachers or from those who are more concerned about science teaching. Therefore, a systematic study of the upper primary textbooks was taken up with the aims:

i) to collect information about the utility of the books from the point of view of child centred learning and feasibility of the textbooks from the point of view of its acceptability by the users.

ii) to gather information to facilitate better revision of our text-books.

iii) to prepare ourselves for better production of new textbooks as and when necessary, and

iv) to encourage professionally constructive criticism of our text-books.

Querries to be satisfied:

The objectives of the study raise questions to be enquired into as follows:

i) How is the textbook liked by the users ?

ii) Whether the language of the textbook is with in the comprehension level or not ?

iii) Whether the concepts and sub-concepts are understood by the children or not ?

iv) Which are the concepts or terms difficult to understand ?

v) What are the different concepts and sub-concepts internalised by children ?

vi) Who help the children an case of any difficulty to understand ?

vii) How do the illustrations or activities help the children in understanding the text ?

viii) Whether the exercises to be done by children are interesting and sufficient ?

ix) Whether the summary at the end help in quick revision ?

METHOD OF STUDY

The study has been designed to evaluate the upper primary science text-books. For the present purpose the science - text-book mean the text-book of science prepared by NCERT for formal system of school education. In the first instance science text-book for class VI has been evaluated.

Elements of Study

Curriculum syllabus and textbooks prepared in NCERT are adopted or adapted in many states and union territories. The Kendriya Vidyalayas the Navodaya Vidyalayas and some of the states/UT's adopt the NCERT syllabus and curriculum and are using NCERT's textbooks. Therefore, the scope of the study has been largely limited to Kendriya Vidyalaya, Government.- schools in Delhi and some of the private unaided schools using NCERT's text-books. Therefore, the elements of the present study comprise of the students and teachers of these schools, using the class VI science text book prepared by NCERT. The students of the higher or lower classes, parents and other users of the present book have been excluded from the study because of they are being secondary users.

Sample

All the students of class VI using the textbook "Science" constitute the poppulation of the study. As

the population of the study is too large, small sample from this population was selected. For the purpose of selecting the sample about 5% of the KVs were selected from all over the country and data was collected from about 25% of the students of class VI of these schools. Method of stepwise random sampling was utilised to draw the sample.

Thus a sample of 30 schools was chosen. The teachers teaching science in class VI were approached through their principals to help us in drawing a random sample of the students of class VI. Each of these schools were requested to randomly select 45 students for sending response to our questionnaire. Thus our sample of study consisted of 30 teachers and 1350 students. However we received response from 16 teachers and 860 students only.

Questionnaire:

For the purpose of collecting data a questionnaire for all the 13 units (Chapters) of this book was prepared in consultation with some of the experts. During the pilot study the questionnaire consisting of 10 questions spread over two sheets was found to be a little too long and which became unabsorbing for the students of class VI in the age group of 10-11 years, as they proceeded to the second page. Therefore the same questionnaire was divided into two. Thus for each unit (chapter) there are two schedule (containing seven questions each) to be administered on different students. Each schedule contains four very simple questions common to both and three more specific different questions. Thus in

all there are 26 different questionnaires for the 13 units. The four common questions numbered 1, 2, 6 and 7 about the book are general in nature where as questions numbered 3, 4 and 5 are more specific. Therefore it has to be noted that the two questionnaires (schedules) for each unit namely 'a' and 'b' differed only in terms of questions 3, 4 and 5. (For example, for Unit-I questionnaires (schedules) were named U1a and U1b). The format for questionnaire (Schedules) was common for all the questionnaires in each set i.e., U1(a) to U13(a) and U1(b) to U13(b).

The questionnaire was prepared keeping in mind that this will be largely a mailed questionnaire. Therefore, an attempt was made that the questionnaire should be self explanatory and in simple language. Unambiguous short sentences were used so that these communicate the same meaning to all the respondents.

The investigator does realise the shortcomings of administering mailed questionnaire on such young respondents but the other methods of data collection like quasi participant observation, or thorough probing or interview schedule etc., could not be used because of shortage of time and other factors, beyond the control of investigator.

An attempt was made to overcome(reduce) the shortcomings of the questionnaire technique by using the administrative machinery of the schools. The questionnaires were sent to the principals of the selected schools. They

were requested to ask the concerned science teacher to administer the questionnaires on the students (respondents) as per the detailed instructions sent for the teachers. These instructions included guidelines to ensure uniformity.

Thus, it not only assured the requisite response but also assured objectivity in data thus collected.

For teachers a separate questionnaire was developed. Through this the teachers were expected to give their assessment about the book as understood by the students, students' difficulties and also report errors if any in the book.

Data Collection

The questionnaires were either handed over to the concerned teachers/principals or mailed to them. The concerned teachers were requested to get the questionnaires filled up by the randomly chosen 25% of the students of class VI. The teachers were also requested to get the questionnaires filled up by the student only xx xx xxxxx xxxx xxx xxxx xxxxx

after the particular unit had been taught in the class. The teachers were additionally advised to ensure that children do not consult among themselves in responding to the questionnaire. After the questionnaires have been filled up the concerned teachers/principals were requested to mail them back to us.

Teachers of these schools were also sent a teacher's questionnaire. They were also requested to fill up that questionnaire and send back the same to us.

Codification, Tabulation and Analysis:

The data thus collected was coded, then mastersheets of data were manually prepared. From the master sheets, simple bivariate tables with percentage indicated at most of the places have also been prepared. However, in table 6.2 modal values have been given. In Table 8 and 9 which deals with difficult terms/concepts/words along with the frequencies of difficulty, the terms/concepts/words have also been given to make the table self explanatory. However the table dealing with figures and diagrams, only figure number, as given in the April 1988 edition of the textbook have been shown.

Teachers data has not been tabulated. Instead these have been discussed along with the interpretation of the table as and when necessary.

Report

The report has been divided into four sections. First is the introduction and second the method of study. In the third the data has been presented alongwith its interpretation and analysis while in the fourth conclusions and suggestions have been included.

Limitations

The present study has many limitations some of which have been indicated earlier. Though there are some questions in students questionnaire which help in cross checking the consistency of the response, the same could not be resorted to extensively in view of the respondents being of very young and tender age. Their level of education being such that they cannot be expected to respond in details in written form. Under such situations the interview method, or quasi-participant observation would have been of much help. A bigger sample of study could have elicited still better results. Further the study could have been supplemented by case studies based on through probing method to substantiate the findings. All these could not be possible because of various administrative constraints.

DATA ANALYSIS AND INTERPRETATION

PRESENTATION AND ANALYSIS OF THE DATA

The two sub questionnaires 'a' and 'b' had four common questions about the book. If N represent the total number of respondents and N_i the number of respondents of the ith unit then,

$$N = \sum_{i=1}^{13} N_i = 860$$

N also represnts the sample under study

Also $N_i = Uia + Uib$

where

Uia = the number of respondents who had answered the questionnaire 'a' half of the ith questionnaire.

and

Uib = the number of respondents who had answered the sub-questionnaire 'b' of the ith questionnaire.

for example when $i = 1$

$$N_1 = N_1 = U1a + U1b$$

i.e. $27 = 16 + 11$

Findings

The three variables identified for liking the science class were (i) the science teachers; (ii) the book and (iii) the content. It has been observed that 18.7% students liked the Science class because they liked the teacher. No details have been obtained regarding what is meant by liking the teacher, that is whether the teacher's personality or the method of teaching makes the class interesting and so on. Similarly 35.9% students liked the science class because they liked the book. Again no details are available as what is meant by liking the book. It can the overall get up of the book, the printing; the paper quality etc. which makes the book interesting. 45.4% students liked the science class because they liked what was taught there. In other words they appreciate the content of the book. Table No. 1 gives the details of the observations made regarding the appreciation of the science class. It also gives the unit wise distribution of students in terms of liking the science class. The critical analysis of which can provide with information like what are the [illegible] which the students liked more.

Table - 1

Cause for liking the Science Class

Size	Teacher	Book	Content
N1=27	2(2.4)	12(44.4)	13(48.2)
N2=124	41(33.1)	56(45.1)	27(21.8)
N3=120	12(10.0)	21(17.5)	87(72.5)
N4=64	5(7.8)	30(46.8)	29(45.4)
N5=45	9(20.0)	28(62.2)	8(17.8)
N6=62	3(4.8)	29(46.8)	30(48.4)
N7=66	9(13.6)	14(21.2)	43(65.2)
N8=56	9(16.1)	9(16.1)	38(67.8)
N9=60	13(21.7)	20(33.3)	27(45.0)
N10=61	16(26.2)	33(54.1)	12(19.7)
N11=65	17(26.2)	20(30.8)	28(43.0)
N12=67	13(19.4)	27(40.3)	27(40.3)
N13=43	12(27.9)	10(23.3)	21(48.8)
$\sum_{i=1}^{13} N_i = 860$	161(18.7)	309(35.9)	390(45.4)

Note: Number in the parenthesis denote corresponding percentage.

According to the observations of the science teachers in general the get up of the book including the printing is attractive but the binding they find is not satisfactory. Also their observation state that the book is not self-sufficient in understanding the concepts. One may conclude that at this stage, the concepts when explained generate interest and hence such a good number (see table 1) in favour of content liking.

97.9% student, 842 out of 860 respondent find the book interesting (table 2.1) and 96.3% student 828 out of 860 (table 2.2) read the book sometimes on their own. There are atleast 14 respondents who donot find the book interesting and atleast 25 respondents who donot read the book on their own.

Comparing with Table 1 and the corresponding observation of the teachers it appears that the content becomes interesting when explained. And once the content is liked by the respondents the book becomes interesting to read.

Table - 2.1

Unitwise Distribution Regarding Liking the Book

Size	Interesting	Not Interesting	No Response
N1=27	26 (96.3)	1 (3.7	Nil
N2=124	122(98.4)	2 (1.6)	Nil
N3=120	119(99.2)	1 (0.8)	Nil
N4=64	64 (100)	Nil	Nil
N5=45	43 (95.5)	Nil	2(4.5)
N6=62	61(98.4)	Nil	1 (1.6)
N7=66	66 (100)	Nil	Nil
N8=56	52(92.8)	4(7.2)	Nil
N9=60	60(100)	Nil	Nil
N10=61	58(95.1)	2 (3.2)	1(1.6)
N11=65	65(100)	Nil	Nil
N12=67	63(94.0)	4 (6.0)	Nil
N13=43	43(100)	Nil	Nil
$\sum_{i=1}^{13} N_i = 860$	842(97.9)	14 (1.6)	

Note: There are four no response cases.

The number in the paranthesis denote corresponding percentage).

Table - 2.2

Unitwise distribution about the book being interesting to read

Size	Read on their own	Do not read on their own	No Response
N1=27	27 (100)	Nil	Nil
N2=124	118(92.7)	6 (4.8)	3(2.4)
N3=120	120(100)	Nil	Nil
N4=64	63(98.4)	Nil	1(1.6)
N5=45	45(100)	Nil	Nil
N6=62	62(100)	Nil	Nil
N7=66	60 (90.9)	5(7.6)	1(1.5)
N8=56	56(100)	Nil	Nil
N9=60	60(100)	Nil	Nil
N10=61	57 (93.4)	3(4.9)	1(1.6)
N11=65	58(89.2)	7(10.3)	Nil
N12=67	62(92.5)	4(6.0)	1(1.5)
N13=43	43(100)	Nil	Nil
$\sum_{i=1}^{13} N_i=860$	828(96.3)	25(2.9)	7(0.8)

Note: The number in the paranthesis denote corresponding percentage)

Table – 3 shows unitwise distribution of appreciation of specific figures and diagrams.

The children were asked to report the diagram or figure they liked most in the particular unit. Accordingly the responses correspond to the figure or diagram appreciated maximum. The table-3 indicates that nearly all the figures and diagrams are liked by some or the other child. However there are a few figures or diagrams which donot fall in the most liked category. Further, there are some figures in many units for which considerably a large number of children have given their preferences, for example figure 1.1, 1.2, 2.4, 2.5, 2.7, 3.1, 3.3, 5.1, 7.7, 9.4, 10.5, 11.2, 11.7 and 13.7. It appears that generally, coloured pictures attract more appreciation, things which fascinate the children also fall in the same category, interestingly, a very simple presentation of a pi-diagram figure 9.4 has been liked by a very large percentage of respondents. It means that a very clear presentation of data is also attractive to the children.

Almost all the respondents feel that the diagrams and figures help in understanding the subject matter. Table – 4 illustrates the above observation. However in a few cases it has been indicated otherwise. This may be seen in the light of the earlier observation where some figures did not fall in the category of liked most (see table 3). The present observation of a few cases of figures/diagrams not been helpful might be regarding such figures/diagrams.

Table - 3

Unit-wise distribution of figures by appreciation

Unit Size Figure No.	U1 a-16	U2 a=60	U3 a=53	U4 a=38
1.	6 (37.5)	2 (3.3)	12 (22.6)	3 (7.9)
2.	6 (37.5)	4 (6.6)	6 (11.3)	2 (5.7)
3.	1 (6.3)	4 (6.6)	13(24.5)	5 (13.2)
4.	3 (18.7)	9 (15.0)	5 (9.4)	1 (2.8)
5.		9 (15.0)	5 (9.4)	2 (5.7)
6.		8 (13.2)	3 (5.7)	-
7.		10(16.5)	1 (1.9)	1 (2.8)
8.		2 (3.3)	3 (5.7)	-
9.		5 (8.3)	-	-
10.		2 (3.3)	1 (1.9)	3 (7.9)
11.		3 (5.0)	3 (5.7)	3 (7.9)
12.		-	-	1 (2.8)
13.		-	-	-
14.		1 (1.7)	-	3 (7.9)
15.		1 (1.7)	-	1 (2.8)
16.		-	1 (1.9)	5 (13.2)
17.		-	-	-
18.			1 (1.9)	-
19.				2 (5.7)
20.				1 (2.8)
21.				3(7.9)
22.				-
23.				-
24.				-
25.				2 (5.7)

Note: Number in the paranthesis denote the corresponding percentage.

Table - 3

Unit-wise distribution of figures by appreciation

Unit size Figure No.	U 5 a=30	U6 a=14	U7 a=38	U8 a=36	U9 a=30
1.	6 (20.0)	3(6.8)	4(10.5)	1(2.8)	-
2.	3(10.0)	1(2.3)	1(2.6)	2(5.6)	1(3.3)
3.	-	1(2.3)	5(13.6)	1(2.8)	3(10.0,
4.	9(30.0)	3(6.8)	2(5.3)	1(2.8)	9(30.0
5.	3(10.0)	2(4.6)	3(7.9)	2(5.6)	2(6.6)
6.	4(13.3)	3(6.8)	6(15.8)	1(2.8)	1(3.3)
7.	-	1(2.3)	7(18.4)	1(2.8)	2(6.6)
8.	5(16.6)	1(2.3)	-	1(2.8)	5(16.5
9..	-	-	2(5.3)	2(5.6)	3(10.0
10.		5(11.5)	-	1(2.8)	2(6.6)
11.		3(6.8)	-	3(8.4)	2(6.6)
12.		1(2.3)	1(2.6)	2(5.6)	
13.		3(6.8)	1(2.6)	5(14.0)	
14.		1(2.3)	2(5.3)	2(5.6)	
15.		1(2.3)	1(2.6)	1(2.8)	
16.		1(2.3)	1(2.6)	6(12.8)	
17.		2(4.6)	1(2.6)	1(2.8)	
18.		3(6.8)	1(2.6)	1(2.8)	
19.		1(2.3)		1(2.8)	
20.		3(6.8)		1(2.8)	
21.		1(2.3)			
22.		1(2.3)			
23.		-			
24.		2(4.6)			
25.		1(2.3)			

Table - 3

Unit-wise distribution of figures by appreciation

Unit size Figure No.	U10 a=35	U11 a=35	U12 a=37	U13 a=26
1.	-	3(8.6)	2(5.4)	1(3.8)
2.	4(11.4)	9(25.8)	2(5.4)	1(3.8)
3.	2(5.7)	3(8.6)	1(2.7)	2(7.6)
4.	5(14.3)	-	3(8.1)	2(7.6)
5.	7(20.0)	1(2.9)	3(8.1)	3(11.5)
6.	3(8.6)	5(14.3)	4(10.8)	1(3.8)
7.	1(2.9)	7(20.0)	2(5.4)	7(26.9)
8.	4(11.4)	5(14.3)	1(2.7)	1(3.8)
9.	6(17.2)	2(5.7)	3(8.1)	2(7.6)
10.	2(5.7)		2(5.4)	3(11.5)
11.	1(2.9)		3(8.1)	1(3.8)
12.			2(5.4)	-
13.			4(10.8)	1(3.8)
14.			1(2.7)	1(3.8)
15.			2(5.4)	-
16.			2(5.4)	

Note: Number in the parenthesis denote corresponding percentage.

Table - 4

Utility of the figures & diagrams

Unit Size	Help in understanding the subject matter	Does not help in understanding the subject matter
U1a = 16	16 (100)	Nil
U2a = 60	58 (96.7)	2 (3.3)
U3a = 53	52 (98.1)	1 (1.9)
U4a = 38	35 (92.1)	3 (7.9)
U5a = 30	28 (93.3)	2 (6.7)
U6a = 44	44 (100)	Nil
U7a = 38	38 (100)	Nil
U8a = 36	36 (100)	Nil
U9a = 30	30 (100)	Nil
U10a= 35	35 (100)	Nil
U11a= 35	35 (100)	Nil
U12a= 37	37(100)	Nil
U13a= 26	26 (100)	Nil
$\sum_{i=1}^{13} U_{ia}$= 478	470(98.3)	8(1.7)

Note; Number in the paranthesis denote corresponding percentage.

> About the utility of diagrams and figures the teachers unanimously agree that a sufficient number of useful diagrams and figures are given in the book. At the same time they suggest that some diagrams like 8.14 may be modified in a such way that more information can be derived about the denture. Similarly a large number feel that the diagram 8.13 regarding the electrolysis of water is beyond the comprehensibility level of the child and also is not required at this stage, rather a simple diagram showing experimental setup for the electrolysis of water, as an activity can be given.

Table 5.1 and 5.2 give information about the utility of summary given at the end of each unit. Most of the respondents feel that the summary covers all the points given in different units. Atleast in five units the respondents are unanimous about this opinion. But for unit 13 atleast 23% respondents think otherwise. The response about summary being helpful for quick revision is also almost similar. Even for unit 13,83.5% children feel that the summary helps in quick revision (see table 5.1).

Table 5.2 gives reasons why the summary has not been liked by some of the respondents. Note worthy cases in this are of unit 8,11,12 and 13.

In case of unit 8 and 12; [illegible] and [illegible] respondents respectively feel that the summary covers all the points but doesnot help in quick revision. In case of unit 11,14.3

Table 5.1

Unitwise Utility of the Summary

Unit Size	I Covers all the points	II Helps in quick revision
U1a = 16	16 (100)	16 (100)
U2a = 60	54 (90.0)	54 (90.0)
U3a = 53	44 (83.0)	48(90.6)
U4a = 38	38 (100)	36 (94.7)
U5a = 30	28 (93.3)	28 (93.3)
U6a = 44	44 (100)	44 (100)
U7a = 38	34 (89.5)	34 (89.5)
U8a = 36	33 (91.7)	36 (100)
U9a = 30	30 (100)	30 (100)
U10a = 35	35 (100)	35 (100)
U11a = 35	30 (85.7)	30 (85.7)
U12a = 37	32 (86.5)	37 (100)
U13a = 26	20 (76.9)	23 (88.5)
$\sum_{i=1}^{13} U_{ia} = 478$	438 (91.6)	451 (94.3)

Note: The number in the parantnesis expresses the corresponding value in percentage.

Table 5.2 *

Unitwise Utility of Summary

Unit Size	III Covers all point but does not help in quick revision	IV Does not cover all points but help in quick revision	V Neither covers all points nor helps in quick revision
U1a = 16	Nil	Nil	Nil
U2a = 60	1 (1.7)	1 (1.7)	5 (8.3)
U3a = 53	7 (13.2)	3 (5.7)	2 (3.8)
U4a = 38	Nil	2 (5.3)	Nil
U5a = 30	2 (6.6)	2 (6.6)	Nil
U6a = 44	Nil	Nil	Nil
u7a = 38	Nil	Nil	4 (10.5)
U8a = 36	3 (8.3)	Nil	Nil
U9a = 30	Nil	Nil	Nil
U10a = 35	Nil	Nil	Nil
U11a = 35	Nil	Nil	5 (14.3)
U12a = 37	5 (13.5)	Nil	Nil
U13a = 26	3 (11.5)	Nil	3 (11.5)
$\sum_{i=1}^{13} U_{13} = 478$	21 (4.4)	8(1.7)	19 (4.0)

*To be read along with Table 5.1

For sample size say U1a = Col.I + Col III + Col V =

Col.II + Col IV + Col V = 16

Similarly to be repeated for all the other twelve unit sizes.

Number in the paranthesis express the corresponding value in percentage.

respondents feel that the summary neither covers all the points nor helps in quick revision. For unit 13, though 23% feel that the summary does not help in quick revision, half of them also feel that it even doesnot cover all the points.'

It is a general belief, that children donot like a large number of questions being asked in any chapter of a book. The present textbook in consideration - Science for class VI, seems to be having a desirable number of questions in each unit. Most of the children seem to be satisfied with the number of questions given in each unit (see table 6.1). Only in case of unit 1, there seem to be some discrepancy, where 25% feel that there are too many questions, on the other side 56.3% feel that the number of questions is too less. Again in unit 9 half of the respondents feel there are too many questions and the other half is satisfied with the number of questions, Unit 8 seem to be perfect in this regard where 100% respondents are satisfied with number of questions in the unit. Another unit in which the number of questions seems to be slightly less is number 5. However in unit 3, 4, 7 and 11; the number of questions seem to be slightly more, (For details see table 6.1).

The teachers in general, are also satisfied with the number of the different types of questions asked in the book. But some (nearly 40%) feel that there must be some exercise which encourage diagram drawing and labelling of the diagrams.

Table - 6.1

Children's view regarding number of questions

Unit size	Too Many	Satisfactory	Too less
U1a = 16	4 (25.0)	3 (18.7)	9 (56.3)
U2a = 60	5 (8.3)	49 (81.7)	6 (10.)
U3a = 53	20(37.7)	32 (60.4)	1 (1.9)
U4a = 38	12(31.6)	26(68.4)	Nil
U5a = 30	3 (10.0)	18(60.0)	9 (30.0)
U6a = 44	4 (9.1)	38 (86.4)	2 (4.5)
U7a = 38	14 (36.8)	24 (63.2)	Nil
U8a = 36	Nil	36 (100)	Nil
U9a = 30	15 (50.0)	15 (50.0)	Nil
U10a= 35	9 (25.7)	26(74.3)	Nil
U11a= 35	12(34.3)	23 (65.7)	Nil
U12a= 37	4 (10.8)	33 (89.2)	Nil
U13a = 26	8 (30.8)	18 (69.2)	Nil
$\sum_{i=1}^{13} U_{ia} = 478$	110 (23.0)	341 (71.3)	27(5.6)

Note: Number in the paranthesis denote corresponding percentage.

In the present study an inquiry was made regarding the number of difficult questions in each unit. It was further tried to elicit information regarding who helps them in removing their difficulties. Table 6.2, gives information on these two accounts. The column I of this table gives the unitwise modal values of the number of difficult questions. Interestingly six units namely 1, 3, 5, 9, 10 and 13 there is no difficult question. Unit 12 has seven difficult questions and unit 11 has five difficult questions. Column II, III, IV of the table indicate who helps the respondents in removing their difficulties. It is encouraging to note that a very few students are helped in this matter by private tutors. Mostly the science-teacher helps in removing the difficulties. However, for unit 2, 6, 11 and 12 quite a large percentage of children; are being helped by people other than science teacher. The unit 11 and 12 seem to be comparatively difficult units of the book.

However teachers feel that unit No. 6, 8, 11, 12 and 13 need more than the alloted time for teaching. There by meaning that the concepts in these unit needs more guidance for internalisation.

Language of a book is an important tool for communication of ideas between the author and the reader. Table 7.1 shows unitwise language comprehensibility of the textbook. It is a pleasure to note that language used in the present textbook is easily understood by ninety percent of the students. In five of the units namely unit 6, 7, 8, 10 and 11. respondents

Table 6.2

Unitwise difficulties and their removal

Unit Size	Difficult Questions (Model Value)	For the understanding and removal of the difficulty, assisted by:		
		Science Teacher	Tutor	Others
U1a - 16	Zero (none)	14 (87.5)	nil	2(12.5)
U2a = 60	2	31 (51.7)	2(3.3)	27(45.0)
U3a = 53	Zero (none)	30 (56.6)	6(11.3)	17(33.1)
U4a = 38	3	33(86.8)	nil	5(13.2)
U5a = 30	zero	18(60)	nil	12(40.0)
U6a = 44	3	19(43.2)	nil	25(56.8)
U7a = 38	4	31 (81.6)	nil	7(18.4)
U8a = 36	4	26 (72.2)	1(2.7)	9(25.0)
U9a = 30	zero	30 (100)	nil	nil
U10a= 35	zero	35 (100)	nil	nil
U11a= 35	5	13(37.1)	2(5.7)	20(57.2)
U12a= 37	7	15 (40.5)	nil	22(59.5)
U13a = 26	zero	18(69.2)	nil	8(30.8)
Uia = 478		313 (65.5)	11(2.3)	154(32.2)

Note: Number in the paranthesis denote corresponding percentage.

are unanimous about the easy understandibility of the language of the unit. However in unit 5, 46.7% children feel that the language is difficult to understand. Besides this unit the other units which fall below the over all average are unit 2, 4, 12 and 13.

> The teachers observation about the language of the book also confirm that the language in general is simple and within the understanding level of the children. Except in a few portions like in unit 2, page no. 23 about the electrolysis of water; unit 7 page no. 3 about the structure of onion peel and cheek cells. Unit 12 and 13 need more explanation and clarification.

Table 7.2 shows the frequency of consultations needed in each unit regarding the language difficulty of the text. As expected in unit 5, 33.3% children needed consultation more than eleven times. Another 33.3% needed consultation between 6 to 10 times. As equal number needed consultation less than 6 times (see also table 7.1). Surprising point to note is about unit 13, though the language of the unit was not considered difficult by a large number of respondants. A very large percentage that is 41.2% needed consultations atleast eleven times or more. It is perhaps because a large number of new terms are being used in this unit which on explanation are understood by the children. Overall most of the children on an average do not need consultation more than five times per unit.

Table 7.1

Unitwise language comprehensibility of the textbook

Unit Size	Easily understood	Difficult to understand
U1b = 11	10 (90.9)	1 (9.1)
U2b = 64	53 (82.8)	11(17.2)
U3b = 67	62 (92.5)	5 (7.5)
U4b = 26	22 (84.6)	4 (15.4)
U5b = 15	8 (52.3)	7 (46.7)
U6b = 18	18 (100)	nil
U7b = 28	28 (100)	nil
U8b = 20	20 (100)	nil
U9b = 30	28 (93.3)	2 (6.7)
U10b =26	26 (100)	nil
U11b =30	30 (100)	nil
U12b =30	25 (83.3)	5 (16.7)
U13b =17	14 (82.4)	3 (17.6)
$\sum_{i=1}^{13} U_ib$: 382	344 (90)	38 (10)

Note: Number in the paranthesis denote corresponding percentage.

Table 7.2

Unitwise frequency of consultation needed

Unit Size	0.5 times	6-10 times	11 times - above
U1b = 11	5(45.4)	3(27.3)	3 (27.3)
U2b = 64	48(7.5)	9(14.1)	7 (10.9)
U3b = 67	23(34.3)	26(38.8)	16(23.9)
U4b = 26	24(92.3)	2(7.7)	nil
U5b = 15	5(33.3)	5(33.3)	5(33.3)
U6b = 18	16(88.9)	2(11.1)	nil
U7b = 28	16(57.2)	12(42.8)	nil
U8b = 20	9(45)	11(55)	nil
U9b = 30	24(80)	6(20)	nil
U10b =26	23(88.5)	3(11.5)	nil
U11b =30	20(66.6)	10 (33.4)	nil
U12b =30	25(83.3)	5(16.7)	nil
U13b =17	7(41.2)	3(17.6)	7(41.2)
$\sum_{U1}^{13}$ Uib = 382	245 (64.1)	[illegible]	[illegible]

Note: 1. For unit U3b =67 in two cases there was no response.

2. Number in the paranthesis denote the corresponding percentage.

One of the question of the sub-questionnaire 'b' was about the terms or words that the students find difficult to understand. For the purpose from each unit a minimum of six and a maximum of eight words/terms, were selected after consultation with the practising teachers. Table 8 gives the unitwise frequency of difficult words/terms representing certain concepts with respect to each unit. From the book, in all, ninety eight words/terms were selected. The analysis of table 8, shows that there are only17 words terms, that is approximately17 percent terms/words are not understood by nearly all the respondents. This may be equivalent to saying that these specific words or terms might be beyond the comprehensibility level of the children of this age or might be these specific words/terms need more elaborate explanation and description. It is encouraging to note that around 50% of the selected difficult words/terms are understood by almost all the respondents. There are a large number words/terms which were perceived as difficult by teachers but were found to be easily understood by all the children of this sample. However there are two words namely Asteroids and Meteor, both appearing in unit 13, which also happens to be the last unit of the book, were understood by none of the respondents excepting one who could understand asteroids (for details see table 8).

Table - 8

Unitwise distribution of difficult words/terms

Unit Size	Words			
	I	II	III	IV
U1b = 11	Communication 4(36.3)	Vaccine 2(18.2)	Pulse-rate 3(27.3)	Blood-pressure 2(18.2)
U2b = 64	Classification 33(51.6)	Condensation 16(25.0)	Evaporation 9(14.1)	Transparent 23(35.9)
U3b = 67	Filter 10(14.9)	Decant 20(29.8)	Centrifuge 39(58.2)	Compound 13(19.4)
U4b = 26	Precaution 18(69.2)	Capacity 5(19.2)	Laboratory 6(23.1)	Mass 2(7.7)
U5b = 15	Tides 10(66.6)	Earthquake nil	Filament 10(66.6)	Heart-beat nil
U6b = 18	Oscillatory 5(27.8)	Vibration 6(33.3)	Friction 5(27.8)	Speed 7(38.9)
U7b = 28	Organism nil	Stagnant 7(25.0)	Habitat nil	Weed 20(71.4)

Note: Number in the paranthesis denote the corresponding percentage.

Table - 8 (contd)

Unitwise distribution of difficult words/terms

Unitsize	Words V	VI	VII	VIII
U1b = 11	Irrigation 4(36.3)	Insecticide 2(18.0)	Scientific-Investigation 8(72.6)	X
U2b = 64	Opaque 34(53.1)	Mineral 2(34.4)	Freezing 10(15.6)	X
U3b = 67	Mixture 6(8.9)	Distillation 28(41.8)	Sublimation 28(41.8)	Crystallisation 34(59.8)
U4b = 26	Periodic Motion 6(23.1)	Temperature Scale 6(23.1)	X	X
U5b = 15	Phases of moon nil	Weathering of rocks 5(33.3)	X	X
U6b = 18	Lever 4(22.2)	Pulley 2(11.1)	Force of gravity 9(50.0)	Lubricate nil
U7b = 28	Species nil	Spores 3(10.7)	Cells 3(10.7)	Stimulus 5(17.8)

Note: Number in the paranethesis denote the corresponding percentage.

Table - 8 (contd.)

Unitwise distribution of difficult words/terms
(From unit 8 to 13)

Unit Size	Words I	II	III	IV
U8b = 20	Supporting roots 6 (30.3)	Modification 11(55.0)	Tendrils 3(15.0)	Pollen 7(35.0)
U9b = 30	Atmosphere nil	Vacuum 5(16.7)	Compressed air nil	Perforation 5(16.7)
U10b= 26	Pollution nil	Transpiration 4(15.4)	Mould 9(34.6)	Salinewater 9(34.6)
U11b= 30	Energy nil	Work nil	Image 13(43.3)	Satellite nil
U12b= 30	Environment 4(13.3)	Producers 5(16.7)	Omnivore 25(83.3)	Pests 16(53.3)
U13b= 17	Universe nil	Planets nil	Telescope nil	Constellation 11(64.7)

Note ; Number in the parantheses denote corresponding percentage.

Table- 8 (contd.)

Unitwise distribution of difficult words/terms

Unit Size	Words V	VI	VII	VIII
U8b = 20	Digestion 4(20)	Glands 17(85.0)	Carpels 10(60.0)	Sepals 7(35.0)
U9b = 30	hinning 4(13.3)	Gliders 4(13.3)	Parachutes nil	Combustion nil
U10b= 26	Hard water nil	Germs nil	Conservation 11(42.3)	Germination nil
U11b= 30	Turbine 9(30.0)	Solar Cell 18(60.0)	Bio- mass 26(86.7)	Decompose 26(86.7)
U12b= 30	Food Chain 23(76.7)	Nutrients 6(20.0)	Scavengers 24(80.0)	Percolation 22(73.3)
u13b= 17	Orbit nil	Asteroids 16(94.1)	Meteor 17(100)	Solar-system nil

Note : Number in the paranthesis denote corresponding percentage.

Table 9 gives the distribution of the frequency of internalised words/terms after the unit has been covered by the teacher. As expected the two words Asteroids and Meteor have not been internalised by any of the respondents (refer table-8) where as there are a number of words/terms which some of the respondents of this sample found not difficult but still they were not internalised, for example weathering of rocks, pests, producers, mould, supporting roots constellation, conservation etc. (see Table-8 and Table 9). It appears that there are around 10 percent of the difficult words/terms (the words/terms for which the internalisation frequency exceeded 60% has been taken as being generally internalised by the respondents) which have been internalised by nearly all the respondents and atleast 40 perdent words (internalisation frequency exceeding 33%) have been internalised by half the sample (for details see Table 9) Comparing Table 8 and Table 9 it appears that there are a number of words/terms which though the respondents donot find difficult but still the rate of these words being internalised is small. For examples earthquake, phases of moon, species, lubricate, satellites, energy etc. Also it appears that many a times the words or terms are internalised in sets or pairs for example - sepals, pollens, tendrils and carpels - Atmosphere, compressed air and vacuum etc. (for details see Table 9).

Table - 9

Unitwise distribution of words internalised
Unit 1 to 7

	Words			
Unit Size	I	II	III	IV
U1b = 11	Communication 5(45.5)	Vaccine 5(45.5)	Pulse-rate nil	Bloodpressure 5(45.5)
U2b = 64	Classification 16(25.0)	Condensation 14(21.9)	Evaporation 21(32.8)	Transparent 24(37.5)
U3b = 67	Filter 52(77.6)	Decant 7(10.4)	Centrifuge 5(7.5)	Compound 23(34.3)
U4b = 26	Precaution 4(15.4)	Capacity 13(50.0)	Laboratory 12(46.2)	Mass 11(42.3)
U5b = 15	Tides nil	Earthquake 5(33.3)	Filament nil	Heart-beat 5(33.3)
U6b = 18	Oscillatory motion 10(55.5)	Vibration nil	Friction nil	Speed 3(16.7)
U7b = 28	Organism 21(75.0)	Stagnant 3(10.7)	Habitat 17(60.7)	Weed nil

Note: The number in the paranthesis denote corresponding percentage.

Table - 9 (contd.)

Words V	VI	VII	VIII
Irrigation 2(18.2)	Inseticide 3(27.3)	Scientific Investigation 1(9.1)	X
Opaque 11(17.2)	Mineral 18(28.1)	Freezing 34(53.1)	X X
Mixture 49(73.1)	Distillation 1(1.5)	Sublimation 4(6.0)	Crystallisation 4(6.0)
Periodic-motion 8(30.8)	Temperature Scale 10(38.5)	X	X
Phases of moon 5(33.3)	Weathering of rocks nil	X	X
Lever 2(11.1)	Pulley nil	Force of Gravity nil	Lubricate 5(27.8)
Species 8(28.6)	Spores nil	Cells 15(13.6)	Stimulus 7(25.0)

number in the paranthesis denote corresponding percentage.

Table - 9 (contd.)

Unitwise distribution of words internalised Unit 8 to 13)

Unit Size	Words I	II	III	IV
U8b = 20	Supporting roots nil	Modification 2(10.0)	Tendrils 9(45.0)	Pollen 9(45.0)
U9b = 30	Atmosphere 23(76.7)	Vacuum 23(76.7)	Compressed air 19(63.3)	Perforation 9(30.0)
U10b = 26	Pollution 9(34.6)	Transpiration 12(46.2)	Mould nil	Saline-water nil
U11b = 30	Energy 11(36.7)	Work 11(36.7)	Image 4(13.3)	Satellites 5(16.7)
U12b= 30	Environment 8(26.7)	Producers nil	Omnivore nil	Pests nil
U13b= 17	Universe 7(41.2)	Planets 10(58.8)	Telescope 5(29.4)	Constellation nil

Note: Number in the paranthesis denote the corresponding percentage.

Table - 9 (contd.)

Unit Size	Words V	VI	VII	VIII
U8b = 20	Digestion 12(65.0)	Glands nil	Carpels 6(30.0)	Sepals 6(30.0)
U9b = 30	Minning 16(53.3)	Gliders 6(20.0)	Parachutes 16(53.3)	Combustion 16(53.3)
U10b = 26	Hard-water 18(69.2)	Germs 14(53.8)	Conservation nil	Germination 4(15.4)
U11b = 30	Turbine 1(3.3)	Solar-cell 4(13.3)	Bio-mass 1(3.3)	Decompose 1(3.3)
U12b = 30	Food-Chain nil	Nutrients 12(40.0)	Scavengers nil	Peroolation nil
U13b = 17	Orbit 5(29.4)	Asteroids nil	Meteor nil	Solar-System 12(70.6)

Note: Number in the paranthesis denote corresponding percentage.

CONCLUSION AND SUGGESTIONS

From table 1, it becomes clear that nearly 45% students liked the science class because they liked the content of the unit for which they were the respondents; and nearly 35% liked the class because they appreciated the book. That approximately 20% liked the science class because they liked the teacher may lead one to the conclusion that the teacher's role is not that important. But if we critically analyse the table 1, it becomes clear that teacher's role is not appreciated much where the unit deals with contents which donot need much explanation, as in the case of units1, 4 and 6. Whereas for units 2, 5 and 10 the role played by the teacher is appreciated more because these units needed the help of the teacher to understand the content. The respondents of unit 5, also find that the language is difficult, table 7.1 Hence it may be concluded that for this unit the teacher's help is needed not only to understand the content but also to understand the language.

The approximately 50% liking for the content and 25% for the teacher for units 9, 11, 12 and 13 may be pointing towards the fact that the contents of these units which were otherwise also interesting become more absorbing after being taught. From the data,low percentage for the teacher and high for the content for unit 7 and 8 may lead one to conclude that these two units which were unanimously termed

as lengthy units by the teachers are appreciated more by the students. It may be that the units are very well explained, thereby adding to the length of the unit.

One may thus conclude that the curriculum load is not in terms of the size but is in terms of the content. One may also hypothesize that curriculum load is inversely related to the volume.

In general it appears that the book is well accepted by the students, table 2.1 and 2.2 supports the observation. However, it also appears that 60% respondents of unit 12, did not find the book interesting. May be they couldnot appreciate the contents for want of a good teacher, (c.f. table 1). It also appears that around 7% of respondents of unit 8, did not find the book interesting may be because the unit contains too many difficult words/terms - compare table 9. It also appears that nearly all the respondents donot have any difficulty as regarding the language of the unit, compare table 7. This observation is also supported by table 2.2.

Though the results of table 2.1, 2.2 and 7.1 show that the language of the book is within the comprehensibility level of the students. The teachers in general have the observation that the language of the book can be still simplified. According to them at times they have to spend a lot of time explaining some English term/word. Hence

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one of the suggestions by the teachers is that very simple and small words should be used as far as possible.

There are around 200 figures and diagrams in the book. Table 3, shows that nearly all of them fall into the best liked category for some or the other respondent. Also it is nearly unanimous that these diagrams and figures help in understanding the concepts. However, it was a general opinion that the book is dull to look at. The figures and diagrams should have been coloured and labelled wherever needed so that the figures and diagrams are self explanatory. It appears that very simple and clear diagrams which satisfy the querries of the respondents are liked most, (table 3.1).

The summary given at the end of each unit is to recaputulate the contents of the unit. Except a very small fraction of the respondents that feel otherwise, the respondents do realise the importance of the summary and feel that it helps in the quick revision, and were in favour of it.

The teachers feel that summary at the end infact gives what all is there in the unit and hence it helps them to design and prepare for the class.

It appears that commonly the respondents are satisfied with the number of questions in the different units, (table 6.1), However the teachers feel that answers

to all the questions must be available in the text. They think that a larger number of objective type questions help in recaputulating the text. Also they feel that more number of open ended questions should be there.

It is very encouraging to note that for the removal of the difficulties, majority of the times the respondents take the help of the science-teacher and the senior family members. Hardly 1% students are assisted by the tutors (Table 6.2).

The high modal value for unit 12 of Table 6.2 may lead one to think that this Unit is least appreciated by the respondents. But the earlier observations, Table 1, 2.1, 2.2, and 7.2 contradicts it . One may thus conclude that since this unit contains more descriptive questions, respondents find the questions difficult. We may suggest here that a particular unit might not contain more than two descriptive question.

The present book was designed and prepared according to the phylosophy that "Science is doing". But it appears that the activities are demonstrated in the class, keepingin mind the time constraints. Very rarely students get a chance of performing them. One suggestion was that the list of minimum number of necessary items may be given at the end of each unit, so that teacher can acquire them prior to taking the class with the help of the students.

Table 8 deals with the difficult words/terms as per the teachers' observation. Surprisingly, some 30% of these words/terms the respondents did not find to be difficult. However many of these are not internalized by the respondents. It becomes a debatable point whether the concepts which are not internalised might be shifted to higher class or not. Otherwise these may require other means for being internalized.

The teachers' observation also suggest that some supplementary reader may be made available to create interest in science. The earlier observation that some of the concepts are difficult to be internalized gets support from the suggestion of teachers for supplementary readers.

The issue is of great significance as, some of the concepts which are not understood or internalized by most of the students are likely to become hinderance in further studies. It may develop a dislike or hatred for science teaching whenever these terms/concepts reappear and are not explained in details taking it for granted that the students have read them earlier.

This fact also substantiate the earlier observation regarding curriculum load. Probably, the explanation given is not sufficient and if explained further, some

more students can be in a position to understand these. Further explanation will definitely increase the size (volume) of the book but will reduce the difficulty level of the content and the curriculum. Therefore, it can be further concluded that the terms/concepts which have not been understood by a large number of students must be explained in greater details in the text-book or otherwise shifted to some higher class. Secondly, for all the terms and concepts to be understood by all the students and further be internalized, it is necessary to provide them with more interesting materials. Such materials should not be bound by the limitations of a textbook and also it should be of a different kind. Teachers suggestion for supplementary reader can be seen in this light.